REMARKS/ARGUMENTS

Reconsideration and continued examination of the above-identified application are respectfully requested.

By way of this amendment, claims 3, 10, 11, 38, 45, 46, 96, and 97 have been canceled. In this amendment, claims 2, 18, 23, 28, 37, 53, 58, 63, 89, 90, 91, 92, 93, and 94 have been amended. In the amendment of the independent claims, essentially, the subject matter of claims 3, 10, and 96 have been added to the independent claims taking into account some claims recite niobium billets and other claims recite tantalum billets. No questions should arise by these amendments. Entry of the amendment is respectfully requested.

Rejection of Claims 2-8, 10-12, 18-21, 23-26, 71-79, 89-91, 95, 96, 98, and 99 under 35 U.S.C. §103(a) over Clark et al. and WO 87/07650 (WO '650) in further view of Friedman et al.

At page 2 of the Office Action, claims 2-8, 10-12, 18-21, 23-26, 71-79, 89-91, 95, 96, 98, and 99 were rejected under 35 U.S.C. §103(a) as being obvious over Clark et al. and WO '650 in further view of Friedman et al. (U.S. Patent No. 5,482,672). The Examiner referred to the previous Office Actions wherein the Examiner alleged that Clark et al. teaches an extruded tantalum billet having a substantially uniform grain size. The Examiner acknowledged that Clark et al. does not explicitly teach the claimed purity, the metal in the article, the sputtering target or resistive film layer, but alleged that WO '650 teaches the purity claimed in claims 2, 7, and 12 and the metal in a sputtering target and a resistive film layer. The Examiner further alleged that WO '650 teaches that the use of highly pure tantalum in the formation of the target results in a high-quality oxide insulating film and metallic tantalum electrode film. The Examiner took the position that it would have been obvious to use the high purity tantalum material of WO '650 in

the process of Clark et al. in order to provide Clark et al. with the desirable result of providing a material that, when formed into a tantalum sputtering target as taught in WO '650, yields a high quality oxide insulating film and metallic tantalum electrode film. The Examiner acknowledged that these references do not explicitly teach the particular extrusion conditions. The Examiner alleged that Friedman et al. teaches the extrusion of tantalum and niobium ingots, including the temperature of extrusion, the coating of the material and the removal of the coating and that the reference teaches that extrusion is advantageous to make bars, rods and tubes out of difficult to make metals such as tantalum and niobium. The Examiner took the position that it would have been obvious to use the particular processing conditions of Friedman et al. to provide rods, bars and tubes of tantalum or niobium. The Examiner further alleged that regarding recrystallization, Friedman et al. teaches the same process steps and that therefore, one would expect the products resulting from the process taught by the reference to be the same as the products from the claimed process. This rejection is respectfully traversed.

The comments set forth in the previous Amendment filed February 8, 2007, as well as prior responses discussing the differences between the claimed invention and the cited art are incorporated in their entirety by reference herein to avoid repeating those same arguments. The additional comments provided by the Examiner in the present Office Action will be addressed.

The Examiner asserts that it would be obvious to have incorporated the extrusion as taught by Friedman et al. into the process of Clark et al. because Friedman et al. teaches that extrusion provides a way to make bars, rods, and tubes (which the Examiner asserts are cylindrical-shaped products) out of tantalum and niobium.

In response, the Examiner is proposing a modification of Clark et al. that would not be shown in Clark et al. or Friedman et al. In particular, Clark et al. takes a 76 mm diameter ingot

and creates a 32 mm thick rolling bar. It is important for the Examiner to realize that the term "rolling bar" as used in Clark et al. is a rectangular object. The Examiner's attention is directed to Fig. 3 of Clark et al., which shows the "annealed rolling bar." Further, the rolling bar is further shown in each of Processes 1-3 in Fig. 2 of Clark et al. As can be seen in each case, a non-cylindrical object is being made. Thus, one skilled in the art would not take the extrusion shown in Friedman et al. and make a cylindrical object in Clark et al., when the whole purpose of Clark et al. is to make a rectangular rolling bar as shown in each of the figures of Clark et al. The Examiner has not provided any reasoning why one skilled in the art would make such a substitution in order to make cylindrical objects in Clark et al., when each subsequent step of Clark et al. is based on working with a rectangular object and not a cylindrical object.

The Examiner further asserts that while none of the references explicitly teach an aspect ratio and diameter as recited in the claims, the Examiner asserts that it would be obvious to use an extrusion technique in Clark et al. for any diameter starting billet. While the Examiner asserts that it would be obvious, the Examiner has stated a conclusion, but has not explained why one skilled in the art would modify Clark et al. and Friedman et al. to have the aspect ratio and diameter set forth in the claims of the present application. Simply stating that a particular limitation would be obvious without showing why the limitation would be obvious or why one skilled in the art would modify the diameter does not establish a *prima facie* case of obviousness. The starting size of the ingot and/or the formation of an extruded billet having a particular diameter would be unobvious over Clark et al. and Friedman et al., as well as WO '650, as described in the present application. Achieving a large extruded tantalum billet having desirable properties with respect to uniform grain size (as that term is defined in the present application), along with an average grain size of 150 microns or less and having a 98% or more recrystallized

billet simply is not shown in any of the references relied upon by the Examiner, nor do any of these references teach or suggest that achieving an extruded billet having these dimensions along with suitable properties would be desirable. In the past, those skilled in the art would take a billet having a particular size, for instance, the 76 mm diameter ingot described in Clark et al., and subject it to various process steps without caring about the billet properties. In fact, Clark et al. does not even attempt to characterize the starting ingot properties for the billet and never once characterizes the properties until a rectangular rolling bar is formed. Similarly, Friedman et al., while primarily relating to powder metallurgy, describes a bar having a 42 mm diameter and nothing else. *See* col. 4, lines 58-60. Thus, Friedman et al. is describing a bar that is over twice as small as the diameter achieved in the present application.

Also, as described in the present application, previous tantalum billets did not have fine and uniform grain size, but instead commercially-produced tantalum billets had a grain structure that varied largely between the center and edge of the billet and typically had coarse, non-uniform grain structure. Furthermore, the Examiner's attention is directed to the examples starting at page 16 of the present application, wherein a commercially-formed billet was compared to extruded billets of the present application. As shown in the figures, and particularly Figs. 3(A) and 3(B), the commercially-made billets were not extruded or formed using the process of the present invention, had a duplex grain structure with broad bands of unrecrystallized material, and had a non-uniform grain size throughout the billet, nor was the billet recrystallized throughout. *See*, for instance, page 18, beginning at line 9 of the present application. This information clearly shows that commercially-made billets, such as the ones described in Clark et al., did not have the properties of the extruded billet of the present invention as recited in the claims. This evidence further shows that the Examiner's assumptions made with

respect to the properties being present is not accurate with respect to the commercial products that existed prior to the present invention. Absent evidence to the contrary, in view of the evidence submitted in the examples of the present application and the failure of the prior art to teach or suggest the limitations of the present claims, a *prima facie* case of obviousness has not been established.

With respect to the Examiner's assertion that the cited art is silent with respect to the claimed duplex microstructure, as explained above, the cited art simply would not achieve this type of structure with respect to a billet having the properties recited in the claims. The Examiner concludes that the references meet this limitation, but the Examiner has provided no reasoning or justification for making this conclusion. To the contrary, the applicants have shown that previous commercially-available billets did not have this property when tested, nor did Clark et al. or Friedman et al. teach or suggest such a property as admitted to by the Examiner. As shown in Clark et al., Clark et al. was concerned simply with taking an ingot and immediately breaking it down into a rectangular rolling bar. Clark et al. did not care about obtaining a cylindrical billet having the large dimensions recited in the claims and obtaining desirable properties for that large billet. In fact, Clark et al. only shows some grain sizes without measuring uniformity only after the tantalum has been subjected to rolling in one or two directions. The Examiner's attention is directed to Table I of Clark et al. wherein various grain sizes are provided. Note, that Clark et al. makes no attempt to understand, measure, or provide grain sizes for billets that have been forged, upset/side-forged, or extruded. Most importantly, Process 3, the process cited by the Examiner, makes no attempt to characterize the extruded material. Clearly, Clark et al. teaches away from achieving desirable properties of a billet that has been only extruded. To the contrary, Clark et al. essentially teaches that one needs to roll to

achieve desirable grain size properties.

Accordingly, for these reasons, and the reasons previously provided throughout the prosecution of this application, this rejection should be withdrawn.

Rejection of Claims 22 and 27-35 under 35 U.S.C. §103(a) -- Clark et al. in view of WO '650, Friedman et la. and Wittenauer et al.

At page 4 of the Office Action, the Examiner rejects claims 22 and 27-35 under 35 U.S.C. §103(a) as being unpatentable over Clark et al. in view of WO '650 and Friedman et al. and further in view of Wittenauer et al. (U.S. Patent No. 5,121,535). The Examiner essentially relies on Clark et al., WO '650, and Friedman et al. as described previously. The Examiner relies on Witttenauer et al. to assert that it would be obvious to use a protective coating on a metal work piece prior to hot working. This rejection is respectfully traversed.

The deficiencies of Clark et al., Friedman et al., and WO '650 discussed above and in previous responses apply equally here. Furthermore, it is noted that Wittenauer et al. specifically relates to processes involving "thin sections of refractory metals." The claims of the present application do not relate to thin sections of metal and, in fact, are the complete opposite. The present invention specifically relates to large cylindrical objects having a diameter of at least 3 1/2 inches and a L/D ratio of greater than 0.5. One skilled in the art would not look to Wittenauer et al., as proposed by the Examiner, to apply such a process to Clark et al. for the reasons previously provided and further because the Examiner is proposing that Clark et al. is being modified to make large extruded cylindrical billets as recited in the present application, and if this is the basis for the rejection, then one would not look to Wittenauer et al., which strictly relates to forming thin metal sections of reactive metals. In fact, at col. 5, beginning at line 38,

Wittenauer et al. states various thickness ranges, such as 100 micrometers to about 10,000 micrometers, and describes the finished material as foil. This is radically different from the teachings of Clark et al. as stated in Clark et al. and as even modified by the Examiner for purposes of this rejection. Accordingly, for these reasons, this rejection should be withdrawn.

Rejection of Claims 37-43, 45-48, 53-56, 58-61, 80-88, 92-94, 97, 100, and 101 under 35 U.S.C. §103(a) over Clark et al. in view of Friedman et al. and in further view of JP '180

Claims 37-43, 45-48, 53-56, 58-61, 80-88, 92-94, 97, 100, and 101 were rejected under 35 U.S.C. §103(a) as being obvious over Clark et al. in view of Friedman et al. and in further view of JP 362104180 A (JP '180). The Examiner referred to the rejection grounds given in paragraph 8 of the Office Action dated January 25, 2005.

The Examiner alleged that although Clark et al.'s teaching is directed to tantalum, one of ordinary skill in the art would have found the claimed extruded niobium billet obvious on the alleged grounds that tantalum and niobium belong to the same group of metals in the Periodic Table and exhibit very similar properties. This rejection is respectfully traversed.

The Examiner has not shown that the teachings of Clark et al. regarding tantalum have any relevance to niobium. Even if the teachings of Clark et al. could be carried over to niobium, the combined references do not teach or suggest the claimed invention for the reasons given above and previously. JP '180 does not teach or show any of the deficiencies noted above, and the Examiner has not proposed that JP '180 does teach or suggest any of the omissions indicated above.

Furthermore, in the Amendment filed February 8, 2007, this rejection has been addressed and the arguments are incorporated in their entirety by reference herein. For these reasons, this

rejection should be withdrawn.

Rejection of Claims 57 and 62-70 under 35 U.S.C. §103(a) -- Clark et al. in view of Friedman et al. and JP '180 and further in view of Wittenauer

At page 6 of the Office Action, the Examiner rejects claims 57 and 62-70 under 35 U.S.C. §103(a) as being unpatentable over Clark et al. in view of Friedman et al. and JP '180 and further in view of Wittenauer. Essentially, the Examiner is relying upon the same arguments set forth above with respect to each of these references. This rejection is respectfully traversed.

As stated above, Wittenauer et al. would not be combinable with Clark et al. and the other cited references. The above reasons are incorporated herein in their entirety. Accordingly, this rejection should be withdrawn.

Rejection of Claims 2-8, 10-12, 18-21, 23-26, 71-79, 89-91, 95, 96, 98, and 99 under 35 U.S.C. §103(a) as being unpatentable over Turner and further in view of Friedman et al.

At page 7 of the Office Action, the Examiner rejects claims 2-8, 10-12, 18-21, 23-26, 71-79, 89-91, 95, 96, 98, and 99 under 35 U.S.C. §103(a) as being unpatentable over Turner (U.S. Patent No. 6,331,223) and further in view of Friedman et al. The Examiner asserts that Turner shows a method for producing high purity tantalum product having a uniform texture and mean grain size of less than 100 microns. The Examiner further asserts that Turner teaches that the starting tantalum preform is an electron beam melting ingot. The Examiner relies upon Friedman et al. as in the above rejections and asserts that it would be obvious to use extrusions steps in Turner to make cylindrical shaped objects. The Examiner again asserts that various parameters set forth in the claims are not shown in Turner or Friedman, but simply concludes that these would be obvious without any technical foundation for making such a conclusion. This rejection

is respectfully traversed.

The Examiner relies upon Turner to assert that Turner shows a uniform texture and mean grain size. However, Turner strictly states that the uniform texture and mean grain size, relied upon by the Examiner, is with respect to the final product, which is a product that has gone through the various deformation stages shown in the Fig. 3 of Turner. As can be seen in Fig. 3 of Turner, which is the very process used in Turner, no cylindrical object is being formed from the tantalum ingot. Every step of Turner relates to the formation of a rectangular object which is subjected to various deformation steps. The particular uniform texture and mean grain size cited by the Examiner is with respect to a final product which is specifically described by Turner as "a tantalum sputtering component." *See* abstract of Turner. The tantalum sputtering component of Turner is not an extruded billet having a diameter of at least 3 1/2 inches with an L/D ratio of greater than 0.5. Again, it would be improper to take these final dimensions of a tantalum sputtering target and assert that these same parameters would be present in an extruded billet. First, Turner is not forming a billet having the desirable properties set forth in claim 2 of the present application and, in fact, the very properties relied upon by the Examiner are for the final product of Turner. This shows one of the major differences between the claimed invention and Turner and Clark et al. That is, these references were concerned with achieving desirable properties at the end through numerous deformation processes. Unlike the cited references, the present invention takes an ingot, for instance, and extrudes it to a billet that is still relatively large in size, but achieves very desirable properties for this billet. This billet having already desirable properties can then be used for further deformation processes and thereby achieving even a more desirable final product. Turner simply provides no suggestion of forming a billet having desirable properties, but again is only concerned with a final product having desirable properties

and this final product is characterized as a tantalum sputtering component (Fig. 3 clearly shows the final product as a plate). Thus, for the Examiner to take the position that it would be obvious to take the process of Turner and form the extruded billet of the present invention simply is not shown in any of the references relied upon by the Examiner. As stated previously with respect to Clark et al., Friedman et al. does not provide the motivation to modify Turner because Turner does not teach or suggest forming an extruded billet having the various parameters of claim 2 and, in fact, in the step going from ingot to the first deformation step, Turner clearly shows the formation of a rectangular object as in Clark et al. Thus, for the reasons also previously provided with respect to Clark et al., in view of Friedman et al., this rejection has the same deficiencies. Accordingly, this rejection should be withdrawn.

Rejection of Claims 22, 27-35, 57, and 62-70 under 35 U.S.C. §103(a) -- Turner in view of Friedman et al. and further in view of Wittenauer et al.

At page 10 of the Office Action, the Examiner rejects claims 22, 27-35, 57, and 62-70 under 35 U.S.C. §103(a) as being unpatentable over Turner in view of Friedman et al. and further in view of Wittenauer et al. Essentially, the Examiner relies on Turner and Friedman et al. and Wittenauer et al. as described above. This rejection is respectfully traversed.

For the reasons provided above with respect to Turner in view of Friedman et al., this rejection should be withdrawn. Wittenauer et al. does not overcome any of these deficiencies. Furthermore, the deficiencies of Wittenauer et al., as described above with respect to the Examiner's reliance on Clark et al., Friedman et al., and Wittenauer et al. apply equally here in this rejection. One skilled in the art simply would not modify Turner in view of Wittenauer et al. and Friedman et al. as proposed by the Examiner as stated above. Accordingly, for these same

reasons, this rejection should be withdrawn as well.

CONCLUSION

In view of the foregoing remarks, Applicants respectfully request the reconsideration of this application and the timely allowance of the pending claims.

If there are any fees due in connection with the filing of this response, please charge the fees to Deposit Account No. 03-0060. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such extension is requested and should also be charged to said Deposit Account.

Respectfully submitted,

Luke A. Kilyk
Reg. No. 33,251

Atty. Docket No. CPM00029CIP (3600-328-01)
KILYK & BOWERSOX, P.L.L.C.
400 Holiday Court, Suite 102
Warrenton, VA 20186
Tel.: (540) 428-1701
Fax: (540) 428-1720